

Background:

Quantum many body systems are an active area of research. Numerical simulation is one of the primary ways we study these systems. There are infinitely many ways to set up these simulations, but they share a lot of the same boilerplate. The main techniques of Variational Monte-Carlo, and neural networks are the same at their core. This library aims to fill this gap in the ecosystem, providing ergonomic tooling to set up these different techniques and introducing (then) novel Neural Quantum States, which are ways to use neural networks in order to simulate these systems.

Description:

NetKet is a library first developed by Giuseppe Carleo and Matthias Troyer in 2017. This library introduces tooling to work with VMC and NQS. There are a wealth of tutorials on simple examples of how to use the library on their website, in many different many body scenarios. It is built on Jax and Flax, so it automatically takes advantage of your GPU for differentiable programming. It includes a few different common Hamiltonians, such as the Heisenberg Hamiltonian for spin chains, and automatically constructs both the hamiltonian to your specification as well as the Hilbert space for it. You can easily convert these to sparse matrices to solve exactly to double check your work as well.

Application:

This has a wide variety of applications. This can be used on any quantum system you are trying to simulate, although it's aimed at many body systems. You can use multiple techniques to simulate these systems. While the library was first aimed at many body systems you can also use it for variational tomography, and bosonic and fermionic simulations.

References:

<https://www.netket.org/>